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lesson
summaries
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ABOUT EDUTRONICS

The lessons described in this booklet provide valuable educational assistance for anyone involved with computers. Animated color and sound films, together with supporting materials, speed the learning process. It has been demonstrated that the film lesson, communicating in a dynamic and viewer-involving medium, supports written materials as well as it improves the retention of skills-level knowledge. And this process is accomplished with the greatest convenience. Edutronics lessons can be presented to individuals, even at their desks, by means of a compact, rear-projection viewer and an audio headset. As a result, time is saved while vital information is being transmitted — and absorbed — with maximum ease and efficiency. For school use, lessons are available for front screen projection if desired.

Long experience in the field of computer education has enabled us to define precisely those individuals who benefit most from Edutronics lessons. The following key will help readers match each lesson with its appropriate category of users.

M — managers;
A — analysts;
P — programmers;
O — operators.

Some lessons are not necessarily required viewing for each group. We have, therefore, delineated these groups by using the word "optional" in conjunction with such lessons.

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COURSE: HUMAN FACTORS

Major Topic:	Aptitude Test
Lesson Title:	Should I be a programmer?

This film speaks to the prospective programmer in a warm and instructive manner. It alerts him to the challenges and rewards to be found in the expanding computer industry, concentrating upon the computer programmer as a vital member of the operation team. The computer is examined as an exciting new tool for the use of industry and government, serving man's increasing needs for rapid information processing.

This film also serves as a valuable prelude to succeeding courses, introducing many technical concepts to the novice.

COURSE: COMPUTER CONCEPTS

Major Topic:	Computers
Lesson Title:	The computer era

This film presents the computer as a tool used to help men find better ways of solving problems and making decisions in an increasingly complex world. Shown are examples of the rapidly growing use and accessibility of computer and some major changes in society resulting from this growth. The capabilities and limitations of computers are portrayed in humorous sequences and related to the need for creative direction of people and machines to achieve results. Some of the frustrations and rewards of working with machines are also portrayed in this sequence.

Lesson Title: The color computer

The proper use of any tool requires an understanding of how it works. This film shows how computers work in an interesting, humorous and non-technical manner. The visual convention of the "color-computer" (used in the DATA PROCESSING PRINCIPLES films) is first introduced in this film.

The color computer (cont.)

In addition, the evolution of computers as a response to man's increasing needs is portrayed in scenes drawn from computer history, and the organization of a computer is explained by analogy as is the stored program concept, storage, instruction, program vs. data, address, input, output, loops, loop-control, instruction modification, programmed switch, open and closed sub-routines, and sub-routine linkages.

Major Topic: Tools

Lesson Title: Computers and imagination

It is vital that trainees in programming, systems and analysis, and computer operations have some knowledge of the problem-solving process. This film first examines human problem-solving, then its component parts and their relationship to each other.

A visual model of human problem-solving is developed and used to show areas where only humans can play important roles. Thus, by process of elimination, the role of the computer is isolated and contrasted with the human tasks of idea-generation, planning, and decision-making.

Five steps in problem-solving are depicted: problem definition, analysis, design, implementation, and documentation. Visual conventions underlying problem-solving tools are also illustrated. These include: logic, flowcharting, and decision tables.

Lesson Title: Computers and logic

This film employs magnetic cores to introduce the fundamental concepts of on and off, yes and no, true and false. It then proceeds to the logical operations of complementation, union, and intersection. Truth tables are also displayed to clarify these logical operations.

Techniques are illustrated by a simplified humorous problem, such as finding all the beautiful

Computers and logic (cont.)

girls in a universe. Venn Diagrams are introduced and used as a graphic representation of this logical problem, thus permitting reinforcement and review of the basic logical tools used in working with computers. Visual conventions are developed for representing trees and partitions of sets.

Lesson Title: Flowcharting

The general use of a flow chart to describe a process is illustrated by several examples. These examples are drawn from everyday experiences, such as finding a parking space or baking a cake. The final flow chart illustrates a simple computer program. The structure of a loop is examined and the concept of nested loops is introduced. Similarly, the use of hierarchically organized flow charts is shown as a clear, simple method of describing complex processes.

Lesson Title: Decision tables

In this film we review several of the obstacles to effective communication emanating both from man-to-man and from man-to-machine. Difficulties, such as extremely high information density, unusual complexity of content, and complex logical organization are used to substantiate the need for summarizing information in tables. A simple humorous problem, such as differentiating an elephant from a giraffe, demonstrates the use of a decision table.

An elementary business problem is analyzed visually to illustrate the technique of separating actions from conditions. This problem is then solved by arranging the actions and conditions to form a decision table. Decision tables are related to flow charts, showing that decision tables and flow charts can be readily combined. The result is effective, more easily maintained documentation. Hierarchies of decision tables depict the simplification which can occur when a modular approach is used.

Major Topic: Hardware Structures**Lesson Title: The hardware spectrum**

This film meets a fundamental training need by clearly describing the interactions between computer hardware and software. For example, animated sequences reveal a spectrum of hardware devices ranging from basic logic circuits to paged associative memories.

Visual conventions depicting registers, gates, decoders, counters, adders, interrupts, and priorities demonstrate these key concepts: instruction fetching, execution, cycles, timing, serial vs. parallel operations, multiprogramming, multiprocessing, and time-sharing.

This film does not discuss circuitry, but instead conveys many important current generation concepts and relates them to software.

Lesson Title: Input/output devices

This film displays the panoramic range of devices used for reading data into and writing data out of modern electronic data-processing systems. Shown are the classes of media and the inter-relationships of device and media characteristics such as data transmission rate, storage density, device organization, and accessibility.

The value of re-entry documents that are designed for ease of use by both men and machines is clearly illustrated. In addition, the film establishes visual conventions for the underlying classes of devices and media.

Major Topic: Software Structures**Lesson Title: The software spectrum**

The evolution of computer software systems is briefly traced. A machine language program is introduced and establishes the need for higher-level languages. The distinction between process-

The software spectrum (cont.)

oriented languages (e.g., COBOL, FORTRAN, PL/1) and problem-oriented languages (e.g., RPG, MARK IV, GPSS) is shown.

Software needs of management information systems and third-generation computers are examined and used to introduce modern operating systems software.

Lesson Title: Operating Systems Concepts

In this film, basic concepts of Operating Systems are explored.

Animation and multiple image techniques portray the concept of comprehensive service programs operating under the supervision of an integrated control program.

The film emphasizes the event driven character of modern Operating Systems. Introduced are the management of jobs, tasks, and data. Operating Systems are seen as unified systems of languages and conventions which organize and control resources to get work done.

Major Topic: Data Structures**Lesson Title: The data spectrum**

This film explores the physical representation of information structures. It develops fundamental color modalities which underly conventions for displaying concepts of computer languages, data processing, and information systems. These modalities are portrayed using a visual hierarchy of bits, bytes, characters, digits, words, strings, lists, fields, pointers, records, files, and associative forms.

Notions of data representation, transformation, compaction, transmission and displays are illustrated within the conceptual framework established by this hierarchy.

COURSE: COMPUTER LANGUAGE CONCEPTS

Major Topic: Language Structures

Lesson Title: The Language Spectrum

Here the concepts of hardware, software, and data structures are reviewed and used to introduce a range of language for processing the data spectrum.

A program with its data is depicted as a sequence of changing information structures, represented by a programming language.

The operators, commands, declarations, directives, delimiters, and structures of several computer languages are contrasted and shown to be related to the data structures being processed.

Lesson Title: Machine Language Concepts

This film uses the Edutronics Color Computer to illustrate the nature of computer instruction sets. Suitable program fragments are explored as dynamic information structures, while illustrating such fundamental concepts as word lengths, instruction formats, loop control, indexing, pointers, effective addresses, and linkage. A variety of data representations is displayed to explore the results of converting data from one representation to another.

This film does not teach machine language programming; rather, it enhances the programmer's ability to use a higher level language intelligently on any particular computer.

Major Topic: Language Essentials (Choose One)

Lesson Title: Essentials of COBOL, Part I

In this film, a simplified business program illustrates minimum essentials of the COBOL programming language.

The characteristic structure of every COBOL program is unfolded. The IDENTIFICATION DIVISION is explained simply. The ENVIRONMENT

Essentials of COBOL (cont.)

DIVISION is shown, and its value in transferring programs from one machine to another is observed. The DATA DIVISION is depicted by relating each entry to the original problem definition. The PROCEDURE DIVISION is displayed by building the program step by step. This shows language facilities for initialization, input, arithmetic, editing, output, and looping.

Lesson Title: Essentials of COBOL, Part II

Using the problem from the previous film, the procedure division is unfolded. The program flow chart is viewed, broken into procedures and translated into COBOL. As each statement is revealed, the action it causes is shown. Language facilities depicted include initialization, input, conditional, arithmetic operations, output and looping.

The goal of this film is to portray the straightforward use of Basic COBOL, enabling students to gain a confident understanding of the essential principles.

Lesson Title: Essentials of FORTRAN

In this film, a suitable numerical programming problem is used to exemplify the basic facilities, available in the FORTRAN language, which are useful to the beginning programmer.

The concepts of INTEGERS and REAL numbers are displayed and related to the arithmetic operations. Input by the READ statement is explained by graphically relating the source document to the FORMAT statement and the READ list. The basic rules for calculation, using the Assignment statement, are depicted. Included are the hierarchy of arithmetic operators and the use of parentheses. Facilities for altering program sequence are portrayed, using forms of the IF statement and the unconditional GO TO statement. Output with the WRITE statement is shown and explained by comparison with the READ statement.

Lesson Title : Essentials of PL/1

This film uses a straightforward programming problem to demonstrate the use of subset of the PL/1 language. A functional approach is employed, starting with a problem definition and progressing through data declaration, input, calculation, output, and flow of control. The simplicity and naturalness of the language are emphasized by developing a program as clear and easy to read as the original problem definition.

Language elements are introduced into the film only as they are needed. This gives students the impression of learning by doing. Unnecessary complications are avoided as well. The objectives of this film are twofold: first, teach a small but useful set of skills; second, prepare students to acquire additional skills as needed.

Major Topic : Language Workshop**Lesson Title : Putting the computer to work**

In less than 10 minutes, this film introduces the viewer to a direct "HANDS ON" experience that includes the steps required to get a problem into a computer and obtain a result. The viewer analyzes the problem; makes a flow chart of the solution; uses this chart to develop a program employing an appropriate language; keypunches the program; feeds the cards to the computer to test his program; and receives output data.

The film uses a light style and a character to involve the viewer directly, showing the mistakes and frustrations likely to be encountered in a normal situation.

COURSE: PROGRAMMING CONCEPTS**Major Topic : Programming Principles****Lesson Title : Elements of program design**

This film states some criteria that have been proposed for program design. Each of the criteria is applied to the same programming problem in turn.

Elements of program design (cont.)

The resulting procedures are observed and compared. The student is led to the conclusion that program design is a compromise.

The film is language-independent. Workbooks tailor the film to the needs of the COBOL, FORTRAN, or PL/1 programmer and exemplify the features of the particular language.

Lesson Title : Elements of program building

This film builds an example program to illustrate fundamental concepts in building programs. Input and Output are explored and related to data structure. Facilities are portrayed for manipulating data, both as symbols and as numbers. The intrinsically sequential form of programs is exhibited and explored in reference to decision logic and repetitive processes.

The film is language-independent. Workbooks tailor the film to needs of a COBOL, FORTRAN, or PL/1 programmer and exemplify the features of the particular language.

Lesson Title : Elements of program testing

This film introduces fundamental concepts of program testing, and illustrates them with carefully chosen examples. In particular, program testing is related to program design. Test data selected reveal instances of data dependency, and incomplete decision logic.

The film is language-independent. Workbooks tailor the film to needs of the COBOL, FORTRAN, or PL/1 programmer and exemplify the features of the particular language. Special facilities of a particular language for program testing are illustrated in the appropriate Workbook.

Major Topic : Programming Techniques**Lesson Title : Program design techniques**

This film uses an innocent-looking programming

Program design techniques (cont.)

problem to illustrate the need for some powerful techniques in program design. One at a time, some obvious complications are added to the problem definition. The film illustrates how the redefined problem calls for additions to the program which make it clumsy, difficult to read, and tedious to test.

The film is language-independent. Workbooks tailor the film to needs of the COBOL, FORTRAN, or PL/1 programmer and exemplify the features of the particular language.

Lesson Title: Program building techniques

In this film, a program is constructed to exemplify certain techniques in programming. Particular attention is paid to the use of subroutines and the elimination of redundancy. Arrays and subscripting are illustrated as ways to simplify programs and avoid opportunities for error. The film also demonstrates the effect of carefully constructed modular programs on maintenance and testing.

The film is language-independent. Student Workbooks tailor the film to needs of a COBOL, FORTRAN, or PL/1 programmer and exemplify the features of the particular language.

Lesson Title: Program testing techniques

This film uses an example program to illustrate some powerful techniques for testing programs efficiently and effectively. The effort required to test adequately is shown to be determined by the original program design. The importance of modular programming is depicted with emphasis on economy and simplification.

This film is language-independent. Workbooks provide the student with practice in applying the principles to COBOL, FORTRAN or PL/1. These workbooks also illustrate the use of special facilities for program testing within a particular language.

COURSE: DATA PROCESSING CONCEPTS

Major Topic: Data Processing Principles

Lesson Title: Basic file concepts

Here we see the increasing impact of computers on society through data transmission and display facilities. Creative problem-solving is strongly contrasted with the less important clerical labor-saving aspects of Information Science.

The notion of data as an organized concept is developed. The hierarchy of characters, fields, records, files, and the data base is portrayed. Basic data representation conventions for machine-readable files are demonstrated.

Lesson Title: Basic file maintenance

This film visualizes a business application of sequential files. Transaction cards are keypunched and verified from source documents. After transactions have been validated, they are written on tape and sorted. The master file is updated and various report files are written for later printing.

The film provides an excellent introductory overview of a typical business computer application.

Lesson Title: Sequential and direct files

The logical and physical organization of magnetic tape and tape-like files is displayed. The concepts of blocking and label records are graphically explained.

The properties of direct access files are compared with tape files. The essential concepts of tracks, access arms, and cylindrical organization are graphically evolved.

Major Topic: Sequential Files

Lesson Title: File maintenance

This film uses the "color computer" to introduce the function of a Sequential File Maintenance

File maintenance (cont.)

Program. A transaction file containing changes, additions, and deletions, plus a corresponding master file, are traced through a graphic model of the program. In just over three minutes this film summarizes the problem and displays its solution.

Lesson Title: Changes and deletions

This film familiarizes the student with details of flow-charting the sequential file maintenance procedure. For teaching purposes, the problem is shown in simplified form.

This film is the first example of the "Animated Color Flowchart," in which data moves visibly through the flowchart, making for more effective communications.

Lesson Title: Insertions

This film builds on the principles learned in "Changes and Deletions" to reveal a more complete picture of the procedure for sequential file maintenance including the ability to add records to the file. As before, well-chosen test data is followed through the animated flow chart; then through the "color computer." This demonstrates best how the program works.

Lesson Title: Input/output logic

This film exposes the hierarchical character of the existing flow chart by showing the structure of file processing subroutines. Again, test data is animated through the flow chart to demonstrate the behavior of the program. Finally, the flow chart is seen in perspective and the relationship of subroutines to the entire program is made clear.

Lesson Title: File maintenance logic

This film explains the detailed logic of a finished, reliable model procedure for sequential file mainte-

File maintenance logic (cont.)

nance. As before, carefully chosen test data is followed through an animated flow chart. Then, the same test data is observed as it is processed by the "color computer" according to the flow chart.

Lesson Title: End-of-file logic

This film demonstrates the final stages in the filmed Sequential File Maintenance program. End-of-file logic is a common source of programming errors and is given special attention using both the animated flow chart and the color computer to observe the program flow for combinations of transaction and master file EOF conditions.

Major Topic: Direct Access Files

Lesson Title: File Characteristics

This film illustrates the principle that efficient file maintenance and rapid retrieval of data tend to work against each other. File characteristics including volatility, activity, and several others are displayed. All are shown to be useful in evaluating design objectives.

Four basic File Organizational Methods are illustrated as practical techniques, depending on the characteristics and use of a particular file.

Lesson Title: Sequential organization

This film introduces basic visual conventions for representing direct access files and operations on them. Problems of retrieval from sequential files are explored. The serial search strategy is shown and rejected. A binary search algorithm is illustrated, achieving much improvement, yet still too slow for typical business applications.

The film develops a rationale for other file organization techniques better suited for rapid retrieval.

Lesson Title: Direct organization

This film visually suggests the need for a file organization technique, permitting rapid retrieval of records, by logic that is independent of file sequence. Key transformation, using the prime number division algorithm, is demonstrated as a technique to meet this need by computing a pointer directly from a record's key. The problem of synonyms is introduced and progressive overflow is shown as one approach to the problem.

In conclusion, the simplicity and speed of retrieval with direct organization is portrayed.

Lesson Title: Chaining and bucket indexing

This film explores various methods for retrieving records which compete for the same direct access storage address, called synonyms. Chaining techniques are shown as a means of resolving addressing conflicts. Chaining is shown useful when used sparingly. Bucket indexing is portrayed, and developed as an effective, economical approach.

A graphic comparison of various techniques is presented for the viewer to draw his own conclusions.

Lesson Title: Indexed sequential organization

This film implies the need for indexed sequential file organization as a compromise between sequential and direct files. The concept of pointers is illustrated to simplify maintenance and retrieval. Hierarchies of indexes are demonstrated, then, related to arm-movement time and latency as efficiency considerations.

Lesson Title: Indexed sequential processing

This film portrays the essential logic of maintaining an indexed sequential file. Record additions are used to illustrate the structure of a typical index. The implications of more and more additions and deletions are demonstrated. This leads to inde-

Indexed sequential processing (cont.)

pendent overflow areas and chaining. Thus, the need for file reorganization is developed. The basic technique for reorganizing the file is demonstrated on screen.

Major Topic: Data Base Organization**Lesson Title: List structured files**

This film introduces the need for separating the logical organization of files comprising a data base from their physical organization.

A typical business example is used to explore techniques for providing entry-points which correspond to retrieval criteria. Various information structures, including rings and other list forms, are displayed as possible methods for building a responsive data base.

Lesson Title: Advanced file structures

This film surveys some powerful file organization techniques that are not as well understood or as widely used as they should be.

Partitioned files are displayed in their common use for program libraries. They are then developed further to provide a technique for file interrogation, thereby eliminating the need for cumbersome periodic reports. Binary trees are explored as a way of organizing data acquired in random order. This leads to a graphic portrayal of maintenance considerations.

Lesson Title: Tree structured files

This film explores tree structures as a file organization providing rapid retrieval. A binary tree is constructed to demonstrate a way of organizing data acquired in random order. The fact that the binary tree builds a binary search organization into the organization of the file is displayed.

The maintenance considerations of this type of

Tree structured files (cont.)

list structure are graphically portrayed, and lead to a presentation of bi-directional lists as a technique to aid in file maintenance.

Lesson Title: Threaded list files

This film demonstrates the use of threaded lists to organize a personnel skills inventory. Extremely rapid retrieval, based on several search criteria, is depicted with a visual analogy. Records are shown as beads, and lists as threads running through them.

The film exhibits a spectrum of list-structured files useful in a wide variety of applications. Also examined are associated maintenance and retrieval considerations.

Lesson Title: Inverted file indexing

This film unfolds the spectrum of inverted file indexing techniques from threaded lists to bit indexes, providing powerful capabilities for rapid retrieval. The consequences of controlled list lengths are demonstrated. Further examination develops a basis for search strategies that operate entirely on the index structure.

Such techniques are explored visually, and culminate with bit string index structure. Here, pointers are implicit, making possible extremely rapid retrievals.

Lesson Title: Inverted file retrieval

This film illustrates the use of inverted files for very rapid retrieval. It also portrays some concomitant maintenance consideration.

The power of Boolean operations on bit indexes is demonstrated, using compound search criteria. The implications of file changes are exhibited. Particular attention is paid to side effects. Complete inverted files are shown using a visual analogy to matrix transposition, providing capabilities for searching on any criteria in the file.

Lesson Title: Elements of File Usage

This film relates file characteristics to organization techniques for direct access files. These are related to practical examples.

In each example the purpose of the file and its characteristics are unfolded to construct a rationale for the chosen file organization technique.

A payroll file, using sequential organization for ease of maintenance, and an inventory file, using direct organization for very rapid retrieval, are shown as contrasting problems in the selection of a direct access file organization.

Lesson Title: File Usage Considerations

This film displays the relationship of file characteristics and file organization in depth.

Using practical examples, file organizations which represent various compromises between maintenance requirements and retrieval time are presented. The basis for choosing each type of organization in terms of file usage is shown graphically.

The files portrayed range from a magazine subscriber file, using indexed sequential organization, to a market survey, using a completely inverted file.

COURSE: INFORMATION SYSTEMS CONCEPTS

Major Topic: Information Systems

Lesson Title: The company

In this film, a hypothetical firm is introduced by means of live-action and animated sequences. The film identifies several key personnel and explores some of their problems. This is a role-playing scene, which develops an animated model of corporate decision processes. Here, the basic visual conventions represent facilities, materials, manpower, production, products, and market demand. These conventions display the basic

The company (cont.)

distinctions between physical systems and information systems.

The key information systems concepts of rates, levels and delays are further demonstrated in a visual sequence depicting the interaction between the firm and its economic environment. The accounting structure of the firm is used to illustrate measurement of the firm's financial performance as the environment changes.

Lesson Title: The physical system

This film develops the physical system of a hypothetical company. The purpose is to illustrate fundamental systems concepts common to business, government, and industry.

These concepts are demonstrated with fast-moving, animated sequences, punctuated by a series of unusual musical effects, graphic designs, and light-show techniques.

Several processing facilities are used to fabricate raw materials into finished parts. These parts are assembled into end-products and shipped. Materials, facilities, parts, assemblies, and products are displayed through visual forms, percussion sound effects, and color motifs. The result is an audio-visual model of a typical physical system.

Lesson Title: The information system

The control objective of the information system illustrated here is efficient economic response to changing market demand.

Visual designs illustrating rates, levels, reports, delays, feedbacks, and physical systems are systematically organized into an animated audio-visual model of an information system. As the total system visually unfolds, alternating sequences of live-action and animated scenes introduce and illustrate the following concepts: plans, schedules, orders, backlogs, production control, manpower assignment, inventory control, and accounting requirements.

Lesson Title: The applications

In this film, several applications of a management information system are explored. Live-action and animation techniques are employed.

Audio-visual models, illustrating relationships between a physical system and an information system, introduce these applications: demand forecasting, production scheduling, employee information systems, material procurement, and inventory control. All are within the single conceptual framework of an integrated management information system.

The concepts of objectives, strategies, tactics, planning, control, activities, operations, sensors, time-triggers, event-triggers, and application-areas introduced in this film are fundamental to the application of information systems in dynamic environments.

Lesson Title: Information System Performance

In this film, measurement of information system performance in a hypothetical firm is demonstrated, using the company's accounting structure as the yardstick.

Animation, punctuated by unusual musical effects, graphically illustrates the response of the firm to changing environmental conditions.

Variations in response of the firm caused by variations in the planning cycle and in information delays are seen to be reflected in the company's profit and loss statement.

Lesson Title: Applications development techniques

This film illustrates several applications development concepts which underlie the creative use of computers in organizations which produce goods and services under physical and economic restraints.

Production and marketing problems of a business are illustrated by live-action and animated

Applications development techniques (cont.)

sequences. These sequences demonstrate business models, forecasting, exponential smoothing, regression, simulation, production scheduling, optimization, linear programming, project control, and long-range planning models.

Major Topic: Systems Analysis and Design

Lesson Title: The Systems Approach

In this film, animation, graphics, and live action combine to depict the Systems Approach as the planned, iterative development of the Information System.

Shown are the six processes of the Systems Approach — Objectives, Definition Planning, Analysis, Design, Implementation, and Evaluation — and how these processes relate to each other and to the System as a whole.

Identified are the five elements of a process — Output, Input, Processing, Control, and Constraints. The film demonstrates how these elements dynamically interact and how this affects other processes.

The film emphasizes the human element in the successful application of the Systems Approach. The relationship of each basic process and its component elements is illustrated. Key management and systems personnel are shown performing tasks from each process in the construction of an Information System.

This film concludes by presenting an overview giving visual perspective and reinforcing concepts presented.

Lesson Title: Defining System Objectives

This film presents the manager and the Systems analyst as they analyze the information requirements and constraints and identify the decision making process. Emphasis is placed on the key role of the manager in establishing realistic goals for the Information System.

Using animation, live action, and multiple

Defining System Objectives (cont.)

image techniques, information requirements and constraints are seen to be input elements of the Objectives Process. Analysis of the interaction of these inputs is demonstrated, resulting in design specifications of the system goals. Evaluation of systems goal is shown, providing control and feedback, with unattainable goals initiating recycling of the process. Output of the Objective Process is shown to be realistic goals and criteria for systems control and feedback, as well as a set of system constraints.

Lesson Title: Information Systems Planning

This film portrays the systems analysis process of planning as the development of a course of action to achieve desired goals.

Animation, live action, and multiple image techniques are used to develop the Planning Process from its input (the output of the Objectives Process) to the system plan, the output of Planning. The creation of a Study Team and the team's function in the iterative steps of analysis are presented, including: goals, constraints, control, and feedback; design specifications and systems requirements; alternate design approaches; and cost/effectiveness.

The analysis of each alternate design is portrayed in terms of economic benefits, corporate goals, and capabilities. Each alternate is analyzed under marginal conditions and the most feasible alternate identified. This alternate becomes the master plan for detailed design and implementation of the Information System.

Lesson Title: Information Systems Analysis

In this film, Analysis is shown to be common to all other systems analysis processes: Objectives, Definition Planning, Design, Implementation, and Evaluation.

The three basic types of analysis used in the development of an information system are presented in animation sequences and related to the

Information Systems Analysis (cont.)

other information system processes.

1. Problem formulation is depicted as a method to isolate questions and issues, evaluate the environment, and clarify the goals of the system, resulting in identification of System Requirements.
2. Data Collection and Data Analysis is portrayed as a definitive analysis of output requirements relating back to source input data. Emphasis is placed on the order of analysis from output to input in order to prevent the system being built around itself instead of around the Systems Goals.
3. Model Building and Simulation are shown as methods for exploring possible design alternates for the proposed system.

Lesson Title: Information Systems Design

This film reveals design as the process that establishes the formal procedures by which an information system achieves its desired goals.

Animation and multiple image techniques portray the continuing application of the Design Process whenever Analysis occurs. The iterative nature of the process is stressed as it is followed graphically through the broad system design phase, Phase I; Phase II, where alternate approaches are identified; Phase III, in which analysis of output requirements is used to develop detailed input source requirements; and Phase IV, when implementation and Evaluation measure the performance of the system in an operational environment. The documentation requirements within each design phase are explored.

The iterative nature of the design process is further revealed when environmental changes result in modification of the system requirements, and recycling of the systems approach is initiated.

Lesson Title: Information Systems Implementation

In this film, Implementation of the system design is

Information Systems Implementation (cont.)

portrayed as the process which occurs when the system is placed in an operational environment.

In live action and animation sequences are seen the testing of the system, with current and previous performance compared in the context of standardized measurements. Training and Orientation requirements are shown to be essential to optimal use of the system. System Control procedures are examined and the concepts of error retrieval, automatic system prediction and control, and external control procedures including audit trails are explored. The implications of system conversion in phasing from the old system to the replacement system are revealed.

Finally, maintenance is observed as the process of partial replacement of a portion of the system design. The film demonstrates how replacement of part of the system can affect other parts, requiring recycling through all processes of the systems approach.

Lesson Title: Information Systems Evaluation

In this film system evaluation is explored as a continuing process originating with the Planning process and continuing throughout the life of the system. In animation sequences this process is initiated, as the evaluation of alternate approaches to system design, in the Planning Process. Next, evaluation is depicted in the Implementation Process as testing, by comparison, past and predicted performance of the system design. Finally, Evaluation of the operational system is depicted in terms of information-delay costs and systems-response characteristics.

This is a graphic demonstration that throughout the life of the system this periodic, systematic evaluation can cause recycling through the entire systems approach.

